REMARKS

The Office Action mailed June 5, 2002, has been received and reviewed. Claims 1-44 are currently pending and stand rejected. In view of the arguments made hereinafter, the applicant contends that Claims 1-44 are in condition for allowance and the same is respectfully requested. Alternatively, the applicant respectfully requests that the Examiner consider the argument made hereinafter in order to incorporate the same into the record for consideration on appeal.

Rejection of Claims 1-44 Under 35 U.S.C. § 103(a)

Claims 1-44 stand rejected under 35 U.S.C. § 103 as being unpatentable over Saran et al. (U.S. Patent No. 5,998,296) in view of Kobayashi et al. (U.S. Patent No. 4,941,032). Applicant respectfully traverses this rejection, as hereinafter set forth.

M.P.E.P. 706.02(j) sets forth the standard for a Section 103(a) rejection:

> To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, **the prior art reference (or references when combined) must teach or suggest all the claim limitations.** The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). (Emphasis added).

Independent claims 1, 23 and 39 of the present invention recite a semiconductor assembly having a void-free, aluminum alloy-containing material within contact holes in an insulating layer, in direct contact with a substrate, and having a nondeformed aluminum bridge over the contact holes. This product is created by depositing an aluminum material on an exposed surface of the insulating layer, heating the aluminum material to partially fill the holes, applying pressure to the aluminum material to fill the holes, depositing a different metal material over the contact holes and forming a homogeneous metal fill material in the contact holes. This process creates a different product than that described in the Saran et al. reference.

As stated in the specification of the present invention on pages 4 and 5, this application alleviates the problems of void being formed inside each hole below the filled or bridged mouth. Significantly, as stated above, the present invention includes formation of an aluminum bridge over the hole or via that is not deformed or extruded inwardly. The present invention overcomes the limitations contained in the Saran patent.

In response to this issue in the previous Office Action, the Examiner maintains that Saran et al. teaches the "void-free" feature in Figs. 1B and 2B. (Office Action at pg. 3). Applicant respectfully disagrees with the Examiner's reading of Saran et al. and specifically points out that the description of these figures describes applying pressure that "forces the fill metal to descend into opening 20 and **substantially** fills the void therein." (Emphasis added) As expressly stated in Saran et al., the formed structure does not have void-free, homogenous alloy material within contact holes in an insulating material. The Examiner also contends that "the non-deformed aluminum bridge is clearly met by Saran et al. as shown in Fig. 2B, wherein no deformation is shown." (Office Action at pg. 3). Applicant disagrees with this contention as well, since Saran et al. teaches first forming a fill metal layer over the semiconductor, forming a surface coating over the metal fill layer and then applying high pressure on the surface coating to force the fill metal into the opening. (See Saran, column 1, lines 55 to 61 and column 2, line 50 to column 5, line 5). After the formation of surface coating layer 32, pressure exerted on the surface coating layer "forces the fill metal to descend into opening 20." (Id. at col. 3, lines 1-5). With specific reference to Fig. 2B, Saran et al. teaches that pressure exerted on the surface coating layer "forces the fill metal to descend into opening 50." (Id. at col. 3, lines 36-39). As a result, Saran et al. expressly teaches formation of contacts that are deformed or that extrude inwardly. The forced fill process of the present invention completely and evenly fills all of the contact holes, unlike the Saran patent, thus creating a different and more advantageous product.

Additionally, Saran et al. teaches deposition of barrier/adhesion layers 22/24 and 52/54 between the fill metal layer (30/60) and the substrate (18/48), which is contrary to the recitations of the pending claims in the present invention. The present invention eliminates the need for deposition of barrier/adhesion layers in order to conserve the target material composition. (See, page 9, lines 14 to 20 of the present specification). This results in semiconductor assemblies and

devices having an aluminum alloy-containing material that is in direct contact with the underlying substrate and which does not require the existence of a barrier/adhesion layer therebetween. Thus, the present invention results in a semiconductor assembly or device having an aluminum alloy-containing material in direct contact with a substrate and having a nondeformed aluminum bridge over the filled contact holes, which is designed to overcome the limitations of the Saran et al. reference. Accordingly, the Saran et al. reference merely recites the shortcomings of prior art structures and, thus, teaches away from the present invention. Thus, the Saran et al. reference teaches away from the present invention.

In response to this issue in the previous Office Action, the Examiner maintains that because Saran et al. states that a barrier may be included (but is not required), direct contact would have been obvious between the alloy material and the underlying substrate. However, applicant respectfully notes that all the claimed limitations must be met and that Saran et al. does not describe a single embodiment with all of the claimed limitations that also exclude the barrier layer. Stated differently, Saran et al. does not include a single embodiment lacking the barrier layer and including a void-free, homogeneous aluminum alloy material within contact holes in an insulating layer, in direct contact with a substrate and having a nondeformed aluminum bridge over the contact holes. As discussed hereinafter, Kobayashi does not supplement the deficiencies in the Saran et al. reference in order to establish a *prima facie* case of obviousness.

Applicant respectfully disagrees with the Examiner's assessment of the Kobayashi patent. The Kobayashi patent teaches using an aluminum alloy as material for a metal electrode. Specifically, Kobayashi relates to amorphous silicon solar cells and pin type photosensors utilizing transparent conductive thin films that are specifically designed to avoid reduction of reflectivity. (See, Kobayashi at col. 1, lines 12-28, and col. 3, lines 21-26). Kobayashi specifically defines "semiconductor device" as "a solar cell, photosensor, photosensitive drum, thin film transistor, electroluminescent device, and the like . . . ." (Id. at col 4, lines 12-16). In fact, Examples 1-6 of Kobayashi are limited to description of glass substrates and solar cells. (Id. at cols. 5-6).

Notably, Kobayashi fails to teach using the aluminum alloy within contact holes in an insulating layer, as claimed in the present invention. The aluminum alloy of the Kobayashi patent

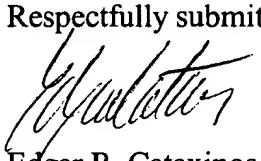
is used only as a metal electrode which can be electrically connected to a semiconductor. In contrast, the formation of the homogeneous aluminum alloy of the present invention is formed within the contact holes or via of the wafer thus improving strength, stress migration and electromagnetic properties of the contact or vias. Because there are no contact holes in the structure of the Kobayashi patent, the Kobayashi patent actually teaches away from a semiconductor structure having a homogeneous aluminum alloy with an insulating layer. Therefore, there is no motivation in Kobayashi to combine any of its elements with the elements of Saran et al., particularly when a number of elements are non-existent therein and where the inventions are drawn to two different types of inventions having different functions and operation. To combine the references as done in the Office Action constitutes impermissible reliance on hindsight reconstruction. In view of the foregoing, applicants respectfully contend that the Saran et al. and Kobayashi references fail to teach the elements contained in the claims of the present invention and thus do not qualify as 103(a) prior art.

Neither Saran et al. or Kobayashi, either alone or in combination, teach or suggest all the claim limitations of independent claims 1, 23 and 39 of which claims 2-22, 24-28 and 40-44 subsequently depend upon. Therefore, reconsideration and withdrawal of the rejection of claims 1-44 under Section 103(a) are respectfully requested.

CONCLUSION

Claims 1-44 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, he is respectfully invited to contact Applicant's undersigned attorney.

Respectfully submitted,



Edgar R. Cataxinos
Registration No. 39,931
Attorney for Applicant
TRASKBRITT
P. O. Box 2550
Salt Lake City, Utah 84110-2550
Telephone: (801) 532-1922

Date: August 5, 2002

ERC/hlg/dn

N:\2269\3359\Amendment.wpd